Formulating a Mixed Integer Programming Model to Solve Multiple Machine Plant Location Problems

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Abstract

The configuration of logistic networks may involve issue relating to plant locations. Indeed, the classic plant allocation problems have been investigated by many researchers over the years. However, certain practical issues in plant location problems remain uninvestigated and require further research. This paper describes one variant of multiple machines plant location problem and uses mixed integer programming to formulate it. Finally, this paper presents a real world plant location problem which was worked on at a timber cutting company.

Keywords: Plant location, multiple machines, mixed integer programming

1. Introduction

Tough competition in global markets, emergence of products with short life cycles, and higher customers' expectations has forced most companies to focus attention on their logistic network. The logistic network consists of suppliers, warehouses, distribution centers, and retail outlets as well as raw materials, work-in-process inventory, and finished products that flow between the facilities. The configuration of it may involve issue relating to plant location.

Companies that can select the location at which their operations are performed may face decisions about location and arrangement at various times. A new company may begin operating in a leased facility, later decide to build its own, and then expand to multiple locations, and so on. Shifts in the location of demand and the addition of new products to those already offered may necessitate the relocation of some facilities or the complete design and construction of new ones. In a dynamic market for its products, an organization may expand, relocate, or add new facilities, which means that location decisions are made throughout the life of a company.

Location decisions are important for certain reasons. First, as mentioned by Dilworth (1992), a company's location affects its ability to compete and many other aspects of its operations. Second, failures to make good location decisions are expensive and have long-lasting consequences. Finally, the effects of location are insidious. The cost of a poor location is an opportunity cost and therefore is hidden.

Indeed, plant location problems have been researched for many years, especially after the appearance of the interest in operation research and management science. Yet, a number of important real world issues and variants have not been investigated or resolved. Francis et al. (1992) have proposed the formulation of planar single-facility and multiple-facility location problems in order to minimize an objective function involving Euclidean or rectilinear distances between the new facility (facilities) and a collection of existing facilities having known planar location. Revelle et al. (1996) suggested some new challenging problems and models of the plant location problem; although no solution techniques were proposed.